A 5 YEAR PLAN FOR SCIENCE AND TECHNOLOGY

1990-1995

Province of British Columbia,
Ministry of Advanced Education,
Training and Technology
Hon. Bruce Strachan, Minister

91-01410/

Executive Summary

This document presents the five-year plan of the Science and Technology Division of the Ministry of Advanced Education, Training and Technology for the years 1990 to 1995. The plan focuses not only on goals, but also spells out the strategy for achieving them. It is the Division's map to the future.

The Science and Technology Division and the Science and Technology Policy

The establishment of the Premier's Advisory Council on Science and Technology (PACST) in 1987 signaled the beginning of a dramatic increase in the government's commitment to the importance of science and technology.

This greater commitment responds to changes in the global economy, which is increasingly being driven by science-based innovation. British Columbia's continued ability to compete in the world depends on its commitment to science and technology. In recognition of this, the provincial Cabinet has charged the Science and Technology Division with providing the leadership and direction to ensure that British Columbia becomes a leader in science-based innovation.

In 1988, the first Science and Technology Policy for British Columbia was adopted by Cabinet. It provides the Division with direction for fulfilling its mandate.

A Twenty-Year Vision for British Columbia

The Science and Technology Policy is built on a vision of British Columbia twenty years from now, as articulated in *Strategies For Innovation*, which presents the Science and Technology Policy of B.C.:

> The emphasis of this vision is on a high quality of life, enabled by modest growth in population, educational and employment opportunities, excellent health care, a clean environment, and prudent management of our natural resources. We see British Columbia as being a centre where innovation is the norm, not the exception.

The Science and Technology Division's commitment to achieving this vision — in all sectors and throughout the province — is expressed in the following mission statement.

Mission and Strategy of the Division

Mission — Implement the Policy

The Science and Technology Division provides leadership and direction and enables opportunities that will result in the complete implementation of the Science and Technology Policy of British Columbia.

Strategy — Create Partnerships

To accomplish its mission, the Science and Technology Division forms **partnerships** with groups in industry, education, labour and other governments. It plays a leadership role in these relationships through planning, policy development, coordination, and the identification of funds for programs.

To develop the strategy, the Division first looked to the future. We then looked at our current activities and at trends in today's world and identified a package of initiatives that we believe will take us to our vision of 1995. In the following sections on infrastructure, research and development, human resource development and public awareness, we present the action plans for the strategy that leads to this vision.

These actions are made possible by the $420 million **Science and Technology Fund**, announced in the 1990 provincial budget.

Infrastructure

The Division recognizes that a successful science and technology policy must be based on a strong infrastructure built with the cooperation of government, industry, education and labour. This infrastructure is actively developed and maintained by creating and supporting committees, programs and agencies.

The Division provides leadership, coordination and financial support to the science and technology community through such programs and agencies as the Science and Technology Development Fund/Assistance Grants for Applied Research (administered by the Science Council of British Columbia) and Discovery Foundation.

It shows leadership in long-term planning and the development of strategic policy directions through participation with groups such as the Premier's Advisory Council on Science and Technology and the Council of Science and Technology Ministers, and through the Strategic Planning for Applied Research & Knowledge (SPARK) process.

Between now and 1995, the Division will continue its efforts in these areas and establish closer relations with other governments, the private sector and academic institutions. The SPARK process will evolve from planning into action. New partnerships will form to enable the Division to participate in the complete continuum of research, development, science education and

public awareness. New Centres of Excellence and Networks of Centres of Excellence will be established.

Research and Development

Science-based innovation is the key to B.C.'s continued ability to compete in global markets. By further developing an already strong expertise in areas such as natural resources and communications, B.C. can generate products for export that will be in demand around the world.

The Science and Technology Division is responsible for promoting R&D through direct funding and coordinating and encouraging R&D activity in both non-government and government agencies. Initiatives already underway will be expanded as B.C. moves toward the national R&D spending target of 2.5 percent of GDP by the year 2000.

By 1995, the province's spending on R&D will increase to 1.6 percent of GDP. Major projects, such as the Media and Graphics Interdisciplinary Centre (MAGIC) and the KAON project (at TRIUMF) will be at or near completion. B.C. will be internationally renowned for astrophysical research with the relocation of the Herzberg Institute of Astrophysics to Victoria. The next five years will see new research initiatives into hydrogen technology and the expansion of the B.C. pharmaceutical industry, which will bring major investment in biotechnology into the province. Continued B.C. participation in the Canadian Space Program will boost R&D in advanced materials and software development.

As R&D becomes increasingly market driven, greater emphasis will be placed on proprietary R&D. Environmental technology has become the next major growth industry. New initiatives and partnerships in the enabling technologies — advanced industrial materials, biotechnology and information technology — will generate hundreds of millions of dollars of benefit. The University of Northern British Columbia will be a leader in scientific R&D targeting northern regional needs.

Human Resource Development

People — highly trained and creative — make innovation happen. In order to ensure that a secure and adequate supply of such people is readily available, the Division is establishing formal links with the Ministry of Education and fostering greater interest in science-related courses at all educational levels.

At higher educational levels, the Division provides financial assistance to partnerships between industry and universities to encourage post-secondary and post-graduate study and research. In addition, the Division, in partnership with industry and education, actively encourages retraining those already in the work force through Science and Technology Awards For Returning Students. The Division also participates in the development of a national action plan by the Council of Education Ministers of Canada for human resource development for knowledge-based industries.

By 1995, a combination of new initiatives and expanded existing ones, such as Scientists in the Schools, will generate greater interest in science among students at all levels and motivate them to continue in mathematics and science through grade twelve. Curriculum changes at post-secondary institutions will ensure a wider exposure to the sciences for all disciplines.

Public Awareness

B.C. must develop a science and technology culture if we want to maintain our competitive position in the world. The Division works closely with partners in other government agencies, industry, and schools and post-secondary institutions to foster this culture. Public awareness of science and technology is enhanced through initiatives such as the annual Science and Technology Week, Science World in Vancouver and the Scientists in the Schools Program.

In 1995, British Columbians will be much more aware of the importance of science and technology in their lives. The Scientists in the Schools Program will be reaching students in all grades across the province. Science and Technology Week will be the culmination of a series of year-round events. An Institute for Research in Sustainable Development will create a greater appreciation of science and technology as key to maintaining environmental quality.

Conclusion

The strategic plan is not a course precisely plotted to known shores. Our vision of the future in 1995 is not a prediction. The action plan, while framed as a series of specific activities, is not meant to be rigid and exclusive. We expect it to be amended, trimmed and added to according to new opportunities. The action plan is intended to confirm directions, emphasis and scale.

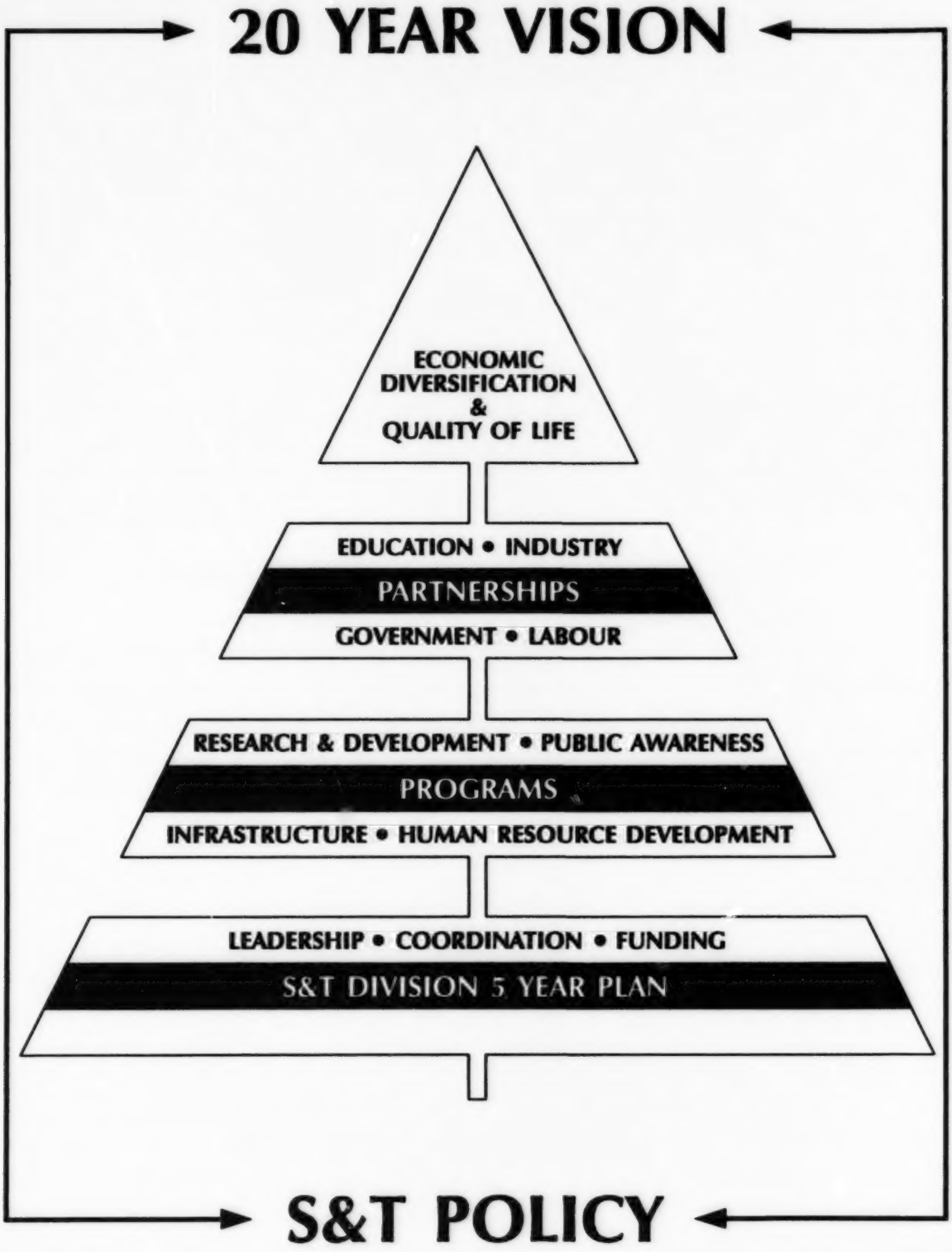
This plan has been created with the assistance of our partners, without whom it cannot succeed. With them, we expect an exciting and rewarding voyage.

Introduction

This document presents the five-year plan of the Science and Technology Division of the Ministry of Advanced Education, Training and Technology for the years 1990 to 1995. This plan, while rooted in the present, allows the Division to invoke a broader vision when it looks to the future. The Division has used this vision to map out its goals for the next five years, based on the values reflected in the province's Science and Technology Policy. The plan focuses on goals and spells out the strategy for achieving them. This plan is the Division's map to the future.

Organization of the Plan

Part 1	The Ministry's Mission
Part 2	The Science and Technology Division and the Science and Technology Policy
Part 3	A Twenty-Year Vision for British Columbia
Part 4	The Science and Technology Division's Mission and Strategy
Part 5	The Science and Technology Fund
Parts 6 to 9	The Division's Action Plan for the next five years For each of the Division's four strategic thrusts, we have identified specific projects or actions leading to the realization of the vision of 1995, the first step in achieving the province's twenty-year vision.
Part 6	Infrastructure
Part 7	Research and Development
Part 8	Human Resource Development
Part 9	Public Awareness


20 YEAR VISION
ECONOMIC DIVERSIFICATION & QUALITY OF LIFE
EDUCATION • INDUSTRY
PARTNERSHIPS
GOVERNMENT • LABOUR
RESEARCH & DEVELOPMENT • PUBLIC AWARENESS
PROGRAMS
INFRASTRUCTURE • HUMAN RESOURCE DEVELOPMENT
LEADERSHIP • COORDINATION • FUNDING
S&T DIVISION 5 YEAR PLAN
S&T POLICY

Part 1 Mission of the Ministry of Advanced Education, Training and Technology

The Mission of the Ministry of Advanced Education, Training and Technology is to promote the advancement of knowledge and human potential leading to:

- an increase in the standard of living through an increase in employability, productivity and earning potential, and scientific and technological know-how of British Columbians;

- enhancement of the quality of life through the application of technology to foster sustainable development, to help solve environmental problems, and to promote environmentally "clean" industries and employment in skilled jobs with higher levels of job satisfaction;

- promotion of equality of opportunity in the system of post-secondary education and skill development for all segments of the population and more specifically for promoting opportunities for women, youth, handicapped, Natives and other disadvantaged groups; and

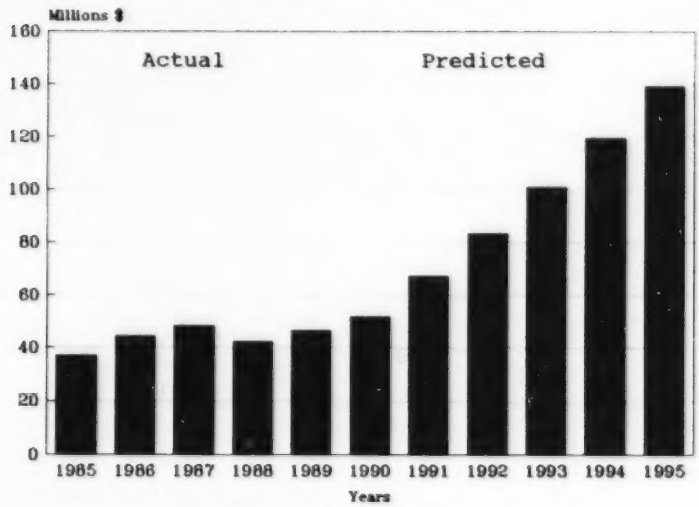
- social and cultural enrichment through advanced education and the fostering of support for the democratic process.

Part 2 The Science and Technology Division and the Science and Technology Policy

In 1987, the Science and Technology Division was transferred from the Ministry of Economic Development to the Ministry of Advanced Education, Training and Technology. That same year, the establishment of the Premier's Advisory Council on Science and Technology (PACST) signaled the beginning of a dramatic increase in the government's commitment to the importance of science and technology.

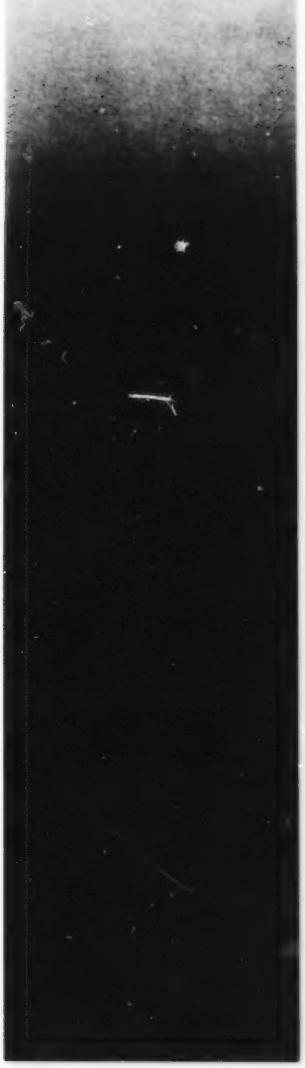
This greater commitment responds to changes in the global economy, which is increasingly driven by science-based innovation. The commitment is reflected in the projections shown below of Gross Expenditures on Research and Development (GERD) in B.C. beyond 1990. These figures represent a B.C. goal of increasing GERD to 2.5 percent of Gross Domestic Product (GDP) by the year 2000. This is consistent with the nationally agreed on target.

FUNDING OF R&D IN BRITISH COLUMBIA



B.C.'s continued ability to compete in the world depends on its commitment to science and technology. In recognition of this, the provincial Cabinet has charged the Science and Technology Division with providing the leadership and direction to ensure that B.C. becomes a leader in science-based innovation.

In 1988, the first Science and Technology Policy for B.C. was adopted by Cabinet. The policy, developed by PACST and approved by the Premier and Cabinet, gives direction to all ministries of the provincial government. It also provides the drive for the Division to fulfill its mandate.



BRITISH COLUMBIA SCIENCE AND TECHNOLOGY POLICY

1. Support the use and development of technological innovations that–
   - build on existing strengths and capabilities
   - have export potential

2. Encourage the use of science and technology to optimize the quality of life for British Columbians through protecting and improving our natural, man–made, and cultural environments, and do so in a way that produces products and services that can be exported.

3. Recognize the importance of basic research, and encourage applied research of an international calibre in areas that contribute significantly to British Columbia's economic development and competitiveness.

4. Foster entrepreneurial enterprises and encourage partnerships among post-secondary institutions, government, industry, and labour that will promote technology transfer and encourage commercialization of the results of our basic and applied research.

5. Support the development of marketing programs that take advantage of British Columbia's unique geographical location and cultural makeup.

6. Strengthen the science and technology components at all levels of the educational system so that scientific and technological literacy is improved, more people are attracted to careers in science and technology, and our universities continue to produce graduates and research of the highest possible calibre.

7. Encourage government, institutions, industry and labour to communicate the benefits of science and technology to the general public so that the public supports science and technology policies and initiatives.

8. Make educational programs available in science and technology to enable retraining, upgrading and acquisition of new knowledge, to ensure an educated and adaptable work force in the trades and professions.

9. Provide a level of direct government financial support for technology-intensive industries that will enable British Columbia to be competitive nationally and internationally.

Source: *Strategies for Innovation*

Part 3 A Twenty-Year Vision for British Columbia

The purpose of the Science and Technology Division is to encourage the full implementation of the Science and Technology Policy in all sectors throughout the province. The Policy is built on a vision of British Columbia twenty years from now.

We see British Columbia as having:

- a strong, global-based economy that provides its people with one of the highest standards of living in the world;
- extraordinary renewable resources (forest, fish, water, wildlife) that it cultivates with care and profit;
- a population of well-educated, healthy people, productively employed;
- a clean environment;
- a special relationship with Pacific Rim countries that fosters exchange and trade;
- a reputation for being a receptive host to visitors who wish to share in its beauty, its adventure, and its industry.

We believe science and technology can make a major contribution to these goals.

The emphasis of this vision is on a high quality of life, enabled by modest growth in population, educational and employment opportunities, excellent health care, a clean environment, and prudent management of our natural resources. We see British Columbia as being a centre where innovation is the norm, not the exception.

Source: *Strategies for Innovation*

Part 4 Mission and Strategy of the Science and Technology Division

Mission — Implement the Policy

The Science and Technology Division provides leadership and direction. It enables opportunities that will result in the complete implementation of the vision of Science and Technology Policy of the provincial government.

Strategy — Create Partnerships

To accomplish its mission, the Science and Technology Division focuses its efforts on forming **partnerships** with groups in other governments, industry and education. The Division plays a leadership role in developing and maintaining these relationships. Leadership is provided through effective planning, policy development, coordination of activities among partners, and the identification of funds for programs and initiatives related to the Science and Technology Policy. This strategy has four thrusts:

Infrastructure

The Division ensures that the organizations and mechanisms required for a knowledge-based economy in British Columbia are in place and operating effectively.

Research and Development

The Division works to have the importance of basic research recognized and encourages applied research of international calibre that contributes significantly to British Columbia's economic competitiveness.

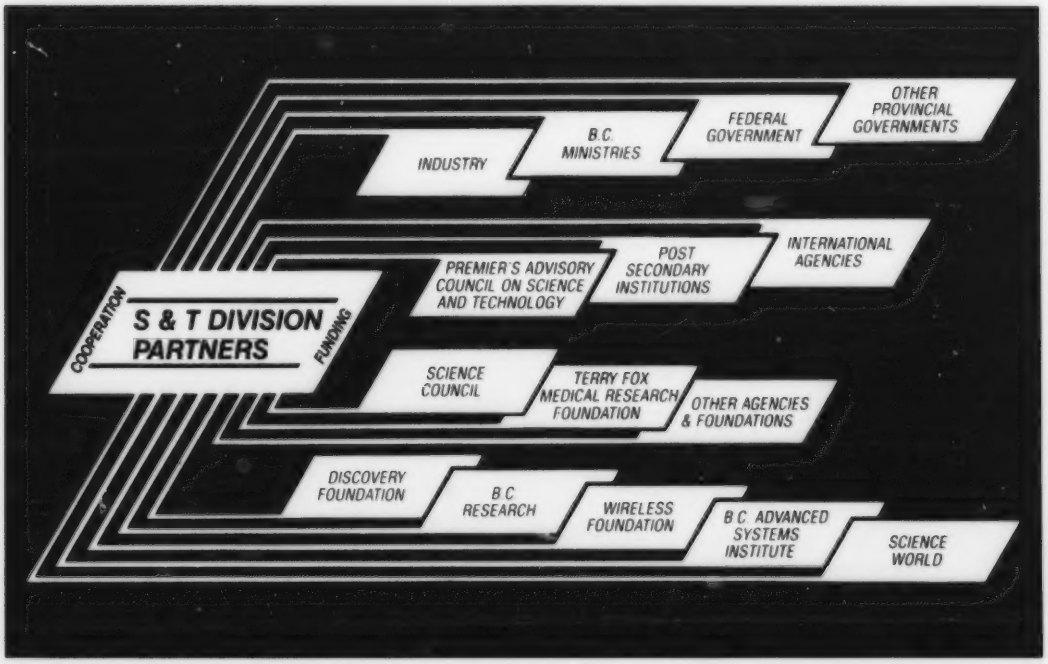
Human Resource Development

The Division promotes the strengthening of science and technology components at all levels of the educational system to improve technology literacy, attract people to careers in science and technology, enable universities to produce highest quality graduates, and enable retraining and upgrading to provide an educated and adaptable workforce capable of meeting industry's demands.

Public Awareness

The Division encourages government, education, industry and labour to communicate the benefits of science and technology in order to foster a science and technology culture in which the general public participates in and supports science and technology.

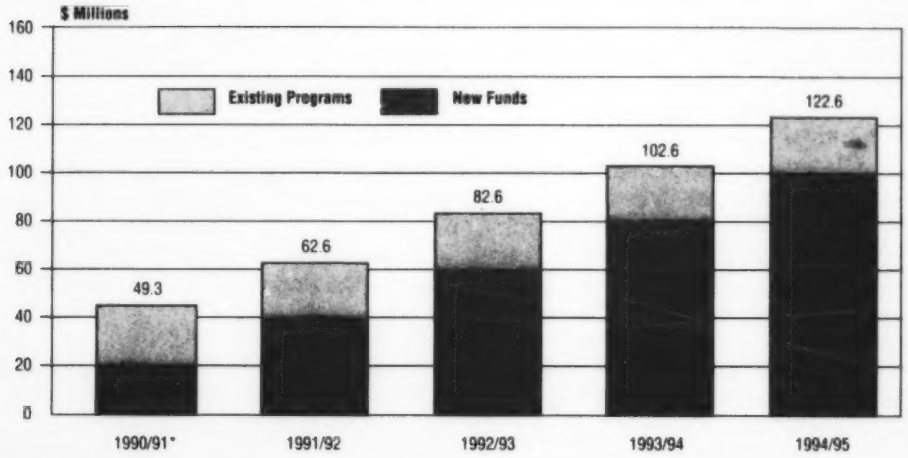
To develop the strategy, we first looked ahead to the world of 1995 and what we could see for science and technology in B.C. We then looked at our current activities and those on the immediate horizon, and at trends and expectations in the world around us. Finally, we identified a package of initiatives and directions that we believe will take us to our vision of 1995. In the following sections, we present the action plans that lead to the realization of this vision. These actions will be made possible by the Science and Technology Fund.



Part 5 The Science and Technology Fund

The initiatives and goals outlined in the Science and Technology Division's Five-Year Plan will be made possible by the new Science and Technology Fund. This fund will provide $420 million for science and technology over the next five years.

SCIENCE AND TECHNOLOGY FUND
FIVE-YEAR EXPENDITURE PROFILE



*Includes $6.7 million for a federal-provincial cost-sharing agreement.

Of the total $420 million committed to the fund, $300 million is new funding. The fund will:

- assist in diversifying the economy;
- enhance industrial competitiveness in new technologies and traditional industries;
- help create new export industries; and
- emphasize new technologies that promote a clean environment and quality of life.

The fund will concentrate on: Industry-based Applied Research and Development, Core Research and Special Projects. All of these activities will be undertaken through partnerships between industry, educational institutions, labour and government under one or more of the four thrusts outlined in this science and technology strategy.

Part 6 Infrastructure

The Division recognizes that a successful science and technology policy must be based on a strong infrastructure made up of organizations and mechanisms acting together. This infrastructure is built with the cooperation of government, industry and education working to ensure that the importance of science and technology is reflected in the life of the province.

The Division actively develops and maintains the science and technology infrastructure by creating and supporting committees, programs and agencies. As these fulfill their original purpose, they are altered to satisfy new demands or phased out. This dynamic challenges the Division's own organization to evolve to meet the ever-changing needs of the science and technology infrastructure.

The Division provides leadership, coordination and financial support to the science and technology community through a host of programs and agencies, such as the Science and Technology Development Fund/Assistance Grants For Applied Research, the Advanced Systems Institute and Discovery Foundation. The Science and Technology Fund, announced in the 1990 budget, provides the financial base for the science and technology infrastructure.

Long-term planning and the development of strategic policy directions are crucial to science and technology policy implementation. The Division shows leadership in these areas through its participation in groups such as the Premier's Advisory Council on Science and Technology, the Council of Science and Technology Ministers, the Western Science and Technology Ministers, and through the Strategic Planning for Applied Research & Knowledge (SPARK) process.

Over the next five years, the Division will increase its input into long-term planning and strategic policy directions through the establishment of closer relations with other governments, ministries, industrial organizations, Crown corporations, research centres, universities and technical institutes. The SPARK planning process will evolve into actions, and a formal link between the Division and the Ministry of Education will be established.

Between now and 1995, the tasks of coordinating and directing science and technology activities will grow and change. The infrastructure will expand as existing agencies and programs grow and new ones are established. New partnerships will form that will enable the Division to participate in the complete continuum of research, development, science education and public awareness. New Centres of Excellence and Networks of Centres of Excellence will be established.

Maintaining and improving the science and technology infrastructure are essential elements of the Division's mission.

Action Plan

Science and Technology Fund Business Plan

The Division is preparing a business plan for the Science and Technology Fund. In order to ensure that the fund provides the greatest possible benefit for all British Columbians, the business plan will be developed through a consultative process involving other government ministries, industry and educational institutions.

Strategic Planning for Applied Research & Knowledge (SPARK)

The Science Council of B.C.'s SPARK process is designed to identify and promote economic development opportunities for B.C. arising from creative applications of innovative science and technology. SPARK committees, made up of representatives from industry, the education community and government, were established to set out sector strategic plans. The Division helps to administer and coordinate initiatives to implement the committees' recommendations. The implementation of recommendations in six sectors will be underway by 1992.

Premier's Advisory Council on Science and Technology

The Division supports the Premier's Advisory Council on Science and Technology (PACST) by providing background information and expert advice that the Council needs to recommend policy directions. The Division develops and implements action plans guided by those policy directions. The Division will be responsible for ensuring that significant initiatives resulting from regional PACST meetings take place in at least five communities around the province each year.

Council of Science and Technology Ministers

The Division supports the Minister and Deputy Minister in their participation in the Canadian Council of Science and Technology Ministers. It also represents the Ministry on a Council task force preparing a national action plan on science and technology that responds to the challenges of the Halifax Declaration. The plan will outline how the nationally agreed on spending target of 2.5 percent of Gross Domestic Product (GDP) for R&D by the year 2000 will be met. The Division will publish a science and technology report card as a yardstick for measuring B.C.'s progress towards this target, beginning in 1990.

Western Science and Technology Ministers

The Division contributes policy direction and support to cooperative efforts in science and technology among the Western provinces. Major cooperative initiatives include: the Western Procurement Initiative, which is aimed at

increasing the West's share of federal procurement contracts; the Earth Environment Space Initiative, which will develop a satellite designed for environmental monitoring; and the Western Working Group on Diversification, whose aim is to develop areas important to further diversification of the West's economy.

Federal/Provincial Programs and Agencies

The Division actively encourages and supports the development of new bilateral initiatives to augment those, such as the Canada/B.C. Science and Technology Subagreement, that are already in place. At least one more bilateral agreement will be in place by 1992. Monthly contact at the executive level will be maintained with federal ministries and agencies dealing with science and technology.

International Initiatives

Many opportunities, such as the KAON factory at TRIUMF and hydrogen research, are emerging for international cooperation in science and technology. In 1990, the Division will develop a plan for exploiting these opportunities and, in 1991, will set up the necessary infrastructure.

Exporting Science and Technology

The Technology Assistance Program, funded by the Division and delivered by B.C. Research, enables small firms to undertake research they would not otherwise be able to because of the high cost of specialized facilities and personnel. The Technology Assistance Program — Part Two, which is designed to provide R&D capabilities in areas outside Vancouver and through organizations other than B.C. Research, will be operating by the end of 1990. Two similar regional initiatives will be developed and in place by 1992, and formal links with potential international partners will be established by 1993.

Technology Transfer

The Division is actively involved in technology transfer through the University/Industry Liaison offices at the three provincial universities. The role of the colleges and universities is being examined to identify ways of increasing and improving technology transfer to industry, especially in the regions.

Crown Corporations

In order to promote more effective use of existing resources, the Division plans to enlist Crown corporations in promoting technology transfer and innovation and in helping to achieve the national objective of investing 2.5 percent of GDP in R&D by the year 2000.

Information Tools

The development of a province-wide database on people, projects and organizations involved in science and technology is being coordinated by the Division and will be operational by 1992. This valuable tool will provide the province with critical information and support the promotion of B.C.-produced exports. Through subscriptions, the database will become self-sustaining within three years. In addition, an in-house agency payment database to help streamline program management will be operating by 1991.

Program Evaluation

In order to make program delivery more effective, the Division is developing an evaluation framework and a long-term evaluation strategy that will be completed by the end of 1990. At least two programs will be evaluated in 1990; all programs will be evaluated on a three-year cycle.

Staff Development

The Division staff is constantly called upon to show imagination and resourcefulness. As the Division's horizons widen, staff will be required to make more timely and complex decisions. Courses to promote resourcefulness and accelerate team building by upgrading skills, increasing knowledge and developing new skills will continue to be provided. Training plans for each staff member and a system for recognizing outstanding work by individual employees will be in place in 1990.

Vision 1995

By 1995, the science and technology infrastructure will have evolved to meet increased demands for leadership, coordination and financial support.

Role of Division

As the importance of science and technology grows, and partnerships flourish, the Division will assume an increasing profile in government. The Division expects, however, that by 2000 its role will change from one of leadership to one of support as science and technology becomes part of the "culture" of every ministry.

Partnerships

The Division will continue to show leadership through the use of **partnerships** to implement the Science and Technology Policy. Existing partnerships will be reinforced. New partnerships with municipalities, other provinces and the federal government will be formed. Closer ties with universities, technical institutes, research centres, industrial organizations and industry will be established. In addition, by 1995, the Division will have broken new ground in establishing at least three international partnerships.

Programs and Agencies

New programs and agencies will have been initiated and existing ones expanded to enable the Division to cover the complete continuum of research, development, science education and public awareness. Others, which have fulfilled their mandates, will have been phased out. The roles of existing agencies, such as Science Council, will have grown to include responsibility for encouraging development in all the emerging technologies. Science World and Science Council will both have become major players in science education.

Funding

The broader financial focus of the Division will be on increasing industry's portion of total R&D spending while maintaining government's commitment. Within the Division, a multi-year planning and budget cycle to allow better adjustment to new opportunities will be in place.

Centres of Excellence

A series of Centres of Excellence and Networks of Centres of Excellence will be in place. B.C. will be recognized as a leader and respected partner in R&D in many areas including biotechnology, advanced materials and information technology.

Part 7 Research and Development

Science-based innovation is the key to B.C.'s continued ability to compete in global markets. The source of this innovation is R&D of international calibre focused on areas of competitive advantage. B.C.'s Science and Technology Policy identifies the province's strengths — areas such as natural resources and communications — as its best competitive opportunities. By further developing an already strong expertise in these areas, B.C. can generate products for export that will be in demand around the world.

The Science and Technology Division is responsible for promoting R&D. Working with both non-government and government agencies, the Division leads the province's R&D effort through direct funding and by coordinating and encouraging R&D activity.

Major R&D initiatives include the expansion of the TRIUMF cyclotron at U.B.C. and the relocation of the Herzberg Institute of Astrophysics to Victoria. Other initiatives in the emerging technologies will be expanded as B.C. moves toward the national R&D spending target of 2.5 percent of GDP by the year 2000.

By 1995, the province's spending on R&D will increase to 1.6 percent of GDP, and the R&D scene will be very different:

- The KAON project at the TRIUMF cyclotron at U.B.C. will be under construction.
- B.C. will be the internationally renowned Canadian centre for astrophysical research.
- The Media and Graphics Interdisciplinary Centre (MAGIC) will lead B.C. into the limelight in the field of computer graphics and animation technology.

In addition we will see:

- major developments in hydrogen technology,
- expansion of the B.C. pharmaceutical industry,
- expanded B.C. participation in the Canadian Space Program.

R&D will become increasingly market driven with a greater emphasis on proprietary R&D. Environmental technology will become the next major growth industry. As a result, 25 percent of all R&D funded through the Division will be in this area by 1995.

New initiatives and partnerships in the **enabling technologies — advanced industrial materials, biotechnology and information technology** — will be generating several hundred million dollars of economic activity annually. The University of Northern British Columbia, located in Prince George, will be a leader in scientific research and development targeted at northern regional needs.

Action Plan

KAON

The provincial government is seeking funding commitments from other governments for the construction of the KAON factory at TRIUMF. The $600 million plus KAON project will make the TRIUMF cyclotron at U.B.C. the premier world facility for high intensity subatomic research. Firm funding commitments will be in place by September 1990, with construction to start in 1991.

Space Program

The Division is working to ensure B.C. industry exceeds the guaranteed minimum of 10 percent participation in the $1.2 billion Canadian Space Program. B.C. companies are involved in projects such as the development and deployment of a remote sensing satellite (RADARSAT), hardware and computer systems for the U.S. space station, and the development of components and operating systems for environment monitoring satellites.

Hydrogen

B.C. will play a lead role in developing hydrogen technology for use throughout the world. Recommendations made to the Premier by the Hydrogen Action Group in March 1990 will be implemented beginning this year.

Pharmaceuticals

The Division is working in partnership with four other ministries to implement a provincial action plan to attract firms that can benefit from financing available through changes to the Patent Act. New initiatives, like the Pharmaco Project already underway, are planned to support the growth of the rapidly developing pharmaceuticals industry.

Advanced Industrial Materials

Initiatives are being developed to ensure that B.C. remains current and competitive in the emerging science and technology areas of advanced materials and high temperature superconductivity. A SPARK coordinator for Advanced Industrial Materials will be appointed this year.

Centres of Excellence

Fourteen Centres of Excellence were announced by the federal government in October 1989, with B.C. represented in thirteen and leading in four. All these Centres will begin operations in 1990 with financial support and

coordination from the Division. The Division is investigating innovative ways of supporting other Centre proposals.

Herzberg Institute

The Division is finalizing arrangements with the National Research Council to relocate the Herzberg Institute of Astrophysics from Ottawa to Victoria by 1993. The move will establish B.C. as a major international centre for astrophysical research.

Space-Based Environmental Research

B.C.'s contribution to an interprovincial initiative on space-based monitoring of the environment is the Division's responsibility. The two elements of the initiative are:

- the development of space-based environment monitoring technology, and
- liaison with the Canadian Space Agency to coordinate Canadian participation in related international programs.

MAGIC

The development of the Media and Graphics Interdisciplinary Centre (MAGIC) at U.B.C. will make B.C. a world leader in the field of computer graphics and animation technology and stimulate the already healthy software industry in the province.

SPIRIT Subsea System Corporation

The SPIRIT Subsea System Corporation was founded to maintain Canada's lead in subsea engineering technology. This industry initiative includes the three universities and the provincial government as partners. Led by the Advanced Systems Institute, the R&D consortium will develop an advanced autonomous underwater work vehicle.

Vision 1995

By 1995, R&D performed in B.C. will have increased by 80 percent and have become more market-focused. Increasingly, it will reflect the values, goals and concerns of the people of the province. The following changes will be evident.

Industry Push/Market Pull

Communication between education and industry will be improved. Just as research institutions provide industry with solutions, research institutions increasingly look to industry for "market pull" on research activities. By 1995, R&D will be progressively more market driven with a greater emphasis on proprietary R&D.

R&D Spending

With the help of new government incentives, such as special procurement opportunities and joint venturing, industry will have increased R&D spending in B.C. to $679 million per year in 1995. Increased investment by industry and increased commitment by the provincial government will have allowed B.C. to reach a target of 1.6 percent of GDP for expenditures on R&D. This will enable us to reach the national target of 2.5 percent by the year 2000.

The Environment

By 1995, the Institute for Sustainable Development, having grown out of the Foundation for Environmental Research and Development established in 1990, will be in its third year of operation, funding $20 to $25 million worth of research per year. Research and development in the environment sector will account for 25 percent of R&D funded through the Division. In 1995, the environmental sector will be a major player in the provincial economy.

Enabling Technologies

The three enabling technologies — **biotechnology, advanced industrial materials** and **information technology** — will have made a strong impact on the B.C. economy. Three large pharmaceutical companies will have major production and research facilities in the province. The advanced industrial materials sector will grow to take advantage of strong regional benefits created by the presence of related existing industries (for example, mining and smelting). The impact of the information technology sector will be clearly visible in all areas of the B.C. economy. Sales in the three enabling technology sectors will be over $100 million per year in each sector by 1995.

Major Projects: Status 1995

1. The **KAON** project will be in its third year of construction.

2. B.C. will be a world leader in the development of **hydrogen** technology as an alternative source of energy. Research into hydrogen technology will be funded at the rate of $50 million per year (1990 dollars).

3. The relocation of the **Herzberg Institute** will bring B.C. recognition as one of the top three centres for astrophysical research in North America. Planning will be underway for the construction of a $50 million radio telescope for Penticton, to be built between 1995 and 2000, and B.C. will have been selected as international headquarters for a new eight-metre optical telescope in South America.

4. The **Media and Graphics Interdisciplinary Centre** (MAGIC) at U.B.C. will be fully developed. MAGIC will be credited in the production of five major motion pictures in 1995.

5. Research and development facilities will be in place in the **University of Northern British Columbia**, located in Prince George. The university will be on its way to being recognized as an international leader in research disciplines focusing on regional development issues.

6. The **SPIRIT Project**, dedicated to developing an advanced autonomous underwater work vehicle, will be complete and much of the projected $500 million in benefits will have been realized.

Part 8 Human Resource Development

People — highly trained and creative — make innovation happen. Only if a secure and adequate supply of such people is readily available will the Division accomplish its mission.

Science education must begin at an early age, and the curiosity and natural interest of young children in science must be maintained into high school. To pursue these goals, the Division is seeking formal links with the Ministry of Education and actively fostering greater interest in science-related courses at all educational levels.

At higher educational levels, the Division provides financial assistance to partnerships between industry and universities aimed at encouraging post-secondary and post-graduate study and research. Research funding through the Science and Technology Development Fund/Assistance Grants For Applied Research offers researchers opportunities to acquire specialized skills. In addition, the Division, in partnership with industry and education, actively encourages retraining those already in the work force through programs such as Science and Technology Awards For Returning Students.

The Division also supports the development of a national action plan by the Council of Education Ministers of Canada (CEMC) for human resource development (HRD) for knowledge-based industries and will assist in implementing the plan.

By 1995, the increased emphasis on human resource development will produce obvious results. A combination of new initiatives and expanded existing ones, such as Scientists in the Schools, will generate greater interest in science among elementary and high school students and provide them with the motivation to continue in mathematics and science through grade twelve. Curriculum changes at post-secondary institutions will be underway to ensure a broader science background for all disciplines. The presence of major R&D initiatives such as TRIUMF/KAON, the Herzberg Institute and MAGIC will result in an increase in both the number and quality of opportunities for scientific training in B.C.

Action Plan

National Action Plan for HRD

The First Ministers have mandated the CEMC to create a national action plan for HRD for knowledge-based industries, in order to ensure Canada's competitiveness in the next century. The Division is supporting this effort through the Council of Science and Technology Ministers, whose recommendations to CEMC are being coordinated by the Ministry of Advanced Education, Training and Technology. The Division will work with Universities, Colleges and Institutes Division and Job Training, Apprenticeship and Labour Market Policy Division in the Ministry, and with other ministries and agencies to implement the HRD plan, expected in 1992.

Science Education

The Division is developing formal links with the Ministry of Education to promote science education throughout the public education system. It is also actively promoting greater science content at all educational levels through programs such as the Graduate Research and Engineering Technology Scholarships and Assistance Grants for Applied Research.

Human Resource Development in Industry

Programs, such as the Industrial Post-Doctoral Fellowships and the Science and Technology Awards for Returning Students, enable the Division to help maintain high levels of expertise in industry. New initiatives aimed at increasing industry's participation in human resource development are being explored.

Vision 1995

By 1995, B.C. will be well on the way to meeting the challenge of providing the people to support its R&D effort.

National Action Plan

B.C. will be leading the implementation of a national action plan on HRD. Institutions will be more responsive to industry demands, and B.C. citizens will have new opportunities as workers, managers and entrepreneurs in knowledge-based industries.

Public Education

Human resource development begins in our primary schools. To provide motivation for students to pursue careers in science and technology, a program to champion the benefits and rewards of such careers will be in its fourth year across the province. Other initiatives to encourage participation in science and science-related activities will have been designed and implemented in cooperation with the Ministry of Education. As a result, there will be an increase of at least 20 percent in the number of school children continuing in mathematics and science through grade twelve.

Universities and Technical Institutes

Substantial curriculum changes will have taken place. Communication links between the Education and Science faculties in our post-secondary institutions will be established. Engineering and science curriculums will include more training in the humanities, social sciences and business so that graduates become effective managers and are able to respond to the demands of the marketplace. In addition, all post-secondary programs will include a significant science component. By 1995, every graduate, regardless of discipline, will have completed a minimum of four science courses.

Part 9 Public Awareness

B.C. must develop a science and technology culture if we are to maintain and expand our competitive position in the world. Such a culture evolves from awareness and understanding about the importance of science and technology to our daily lives, to the province and to the country. The Division works closely with partners in other government agencies, industry, and schools and post-secondary institutions to foster this culture in B.C.

Public awareness of science and technology is enhanced through initiatives such as the annual Science and Technology Week, Science World in Vancouver and the Scientists in the Schools Program. These programs, combined with others, such as the new Science and Technology Action Plan, designed to promote science and technology in government and the private sector, increase awareness about science and technology. They also help to develop understanding and openness about the technological changes we are witnessing every day. As a result, more British Columbians will see these changes as opportunities and be able to make informed decisions about them.

In 1995, British Columbians will be much more aware of the importance of science and technology in their lives. The Scientists in the Schools Program will be reaching students across the province in all grades. Science and Technology Week will be transformed from one five-day event into a series of year-round events culminating in Science and Technology Week. A new Institute for Research in Sustainable Development will create a greater understanding of science and technology as key to maintaining environmental quality.

Action Plan

Science and Technology Action Plan

In 1990, the Division will implement a marketing initiative to promote the use of science and technology in government and the private sector. At least ten ministries will be participating by March 1991, and all ministries will be involved by 1992.

Scientists in the Schools

This program sends volunteer scientists and technicians into the schools to create enthusiasm for science and technology and provide practical information on science-related careers. In the long term, the program will contribute to human resource development as it encourages students to pursue studies in scientific fields.

Science and Technology Week

This annual event (first held in 1989) increases general public awareness through open houses and special activities in the community. Schools are encouraged to undertake extra science-oriented projects to increase student awareness.

Public Awareness Committee

The Division is developing a strategy for implementing the recommendations of the recently completed Rozenhart study of public awareness needs. A committee of interested agencies, led by the Division's new manager for public awareness, will undertake activities to promote science and technology.

Environmental Technology

In 1991, the Foundation for Environmental Research and Development will become the Institute for Research in Sustainable Development. Its role will expand to include a major effort to increase public awareness of the value of science and technology in addressing environmental issues and will build on the credibility established by the foundation.

Information Resources

The Division will coordinate the development of a provincial information service delivered through Science Council and open to the public. A database of science-related activities within the province will be established and available for subscription by 1991. By 1995, the database will include activities across Canada and around the world.

Vision 1995

In 1995, students will recognize that their economic future and quality of life depend on science and technology. The general public will recognize the importance of science and technology to the economic development of B.C. The public will also be aware of the key role science and technology play in solving environmental problems.

Public Awareness in the Schools

Programs, such as Scientists in the Schools, which encourage students in a fun way to pursue science and mathematics courses, will have been extended to all B.C. schools. A cooperative science education program will be established with the Ministry of Education and will operate in at least 85 percent of the junior and senior high schools in the province. This will increase awareness of career opportunities in science-related fields and familiarize students with technological activities in B.C. A career education curriculum, which will be developed with the Ministry of Education, will promote awareness of the rewards of science-related careers and emphasize the vast array of careers available.

Public Awareness in the Community

Science and Technology Week will have been extended into a year-round program of open houses, science fairs and other highly publicized activities, culminating in Science and Technology Week. A Public Awareness Committee, representing government, industry, academia and science-oriented agencies, will identify public awareness needs and coordinate strategies for meeting these needs. Communication with the media will have increased to encourage adequate coverage of provincial technological activities. B.C. will be seen by the country as a leader in developing unified provincial support for science and technology.

Science and Technology and the Environment

Industry and universities will publicize the benefits of investing in the protection of B.C.'s environment. Semi-annual reports of projects coordinated by the Institute for Sustainable Development will be available to the public.

Conclusion

We live in a dynamic world. Some changes we can understand and predict, others we cannot. In this kind of world, strategic planning is very important. We need guidelines to steer our ship, and others need to know where our ship is heading, so they will not be swamped by an unexpected turn.

The strategic plan is not a course precisely plotted to known shores. Our vision of the future in 1995 is not a prediction. We have made it as specific as we could, but we do not expect each detail to be realized as described here. It is a sketch — as vivid as we can make it — of the other shore that we will reach if our plan is successful.

Likewise, the action plan, while framed as a series of specific activities, is not meant to be rigid and exclusive. We expect it to be amended and reviewed annually to meet changing opportunities. In 1993, it will be subject to a formal review. The importance of the action plan is that it confirms directions, emphasis and scale. We will be "satisfied" if we achieve most of the objectives described here — and others besides that result from opportunities not yet evident.

This plan has been created with the assistance of our partners, without whom it cannot succeed. With them, we expect an exciting and rewarding voyage!